Grapevine recovery from fire damage

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Introduction

Bushfires can have devastating effects on vineyards and their occurrence may become more frequent with the changing climate. When damage occurs, grape growers are unsure about determining the appropriate response. Following bushfire damage on 7th February 2009, a small trial was established and other observations were made on a vineyard in central Victoria.

Severity of fire

The intensity of fire across a vineyard can vary considerably. Figure 1 shows the high degree of damage in the trial site (foreground) compared with an adjacent block with little damage (background).

Figure 1 (left). Variation in fire damage

Assessing survival

Leaf damage is easily observed but damage under the bark is obscured. Damaged trunks can be checked by making a small cut with a knife to expose the tissue below. Undamaged trunk tissue remains moist and green, damaged tissue appears dry and pale and dead tissue is brown and dry (Figure 2).

Figure 2. Healthy tissue (left), damaged tissue (middle) and dead tissue (right).

Survival across a small trial block was consistent between the April 2009 and September 2009 assessments (51%). By December 2009 some vines previously assessed as alive did not burst or produced poor growth and were removed reducing the overall survival rate to 29%. Missing vines were replanted.

Pruning trial

Five post-fire pruning treatments were applied to a row of badly damaged vines:

1. no pruning (control)
2. crown + spurs
3. cordon + long spurs
4. cordon + short spurs
5. cane pruned.

The vines were previously cane pruned. The treatments were applied in March 2009 and replicated five times. Assessments were conducted at several times during 2009.

April 2009

Vine survival was determined by counting those vines that had produced re-growth. The total length of shoot re-growth was measured for each treatment. Vine survival was greatest in the un-pruned treatment but not significantly to the other treatments (Table 1). Most re-growth was provided by the un-pruned and cordon + long spurs treatments. A high degree of vine to vine variability diminished the ability to determine significant differences.

Table 1. Vine response to fire after 10 weeks

Treatment	% vines alive	Shoots per vine	Shoot length per vine (cm)
1	71.6	20.9	347
2	50.0	2.7	73
3	48.4	10.8	310
4	60.0	7.9	110
5	65.0	2.0	59
Sig. (LSD)	NS	P=0.003 (8.4)	NS

September 2009

Since the vines were dormant, vine survival was based on trunk health (see Figure 2). There were some differences to the April 2009 assessment with increased survival of cordon + short spurs treatment which had not shown much re-growth in the April 2009 assessment. The cordon + short spurs treatment also had the greatest number of nodes retained at pruning.

December 2009

A post-flowering assessment revealed a decline in vine survival for many treatments (Table 2) as vines that were performing poorly had been removed and replanted. Due to more than 70% of the vines being replaced it was not possible to analyse the results of the assessment. Percentage budburst varied from 60-90% whilst potential crop, based on bunch number per vine, was highest with the cordon + short spurs and un-pruned treatments. The mean fruitfulness over all vines was 0.5 bunches per shoot.

Table 2. Vine response to fire after 10 months

Treatment	% vines alive	% budburst	Bunch number per vine
1	30.8	67.4	11.0
2	21.4	85.0	1.0
3	7.7	83.3	6.0
4	64.3	90.5	13.0
5	21.4	59.2	6.3

Other observations

Fruitfulness of re-growth after the fire

In September 2009 bud dissections from shoots that grew immediately after the fire ('new') were compared with buds from shoots that had grown before the fire ('old'). The proportion of dead primary buds was higher in the 'old' canes that had endured the fire (Table 3). No bunch primordia were detected in the 'new' primary buds after the fire and secondary bud survival was high on both types of shoots.

Table 3. Primary bud dissections

Source of buds	% dead buds	Bunches per bud
'Old' canes	16	1.24
'New' canes	4	0

Hard pruning

A block of Vermentino vines were pruned back hard to basal nodes along the cordon in response to fire damage. Whilst re-growth was strong (1.3 shoots per count node) the shoots that grew in the following season were primarily from the post-fire re-growth and fruitfulness was low (0.13 bunches per shoot).

Low intensity fire

A nearby block of Shiraz was less affected by fire with only sporadic leaf desiccation from the fire and no post-fire treatments were applied. In December 2009 the re-growth was strong (1.1 shoots per count node) and the potential crop (1.6 bunches per shoot) was similar to expectations for non fire affected vines.

Conclusions

• With low intensity fire damage (incomplete leaf desiccation, no trunk injury) there appears to be little impact on growth and fruitfulness in the following season – no post-fire pruning needed.

• For medium intensity fire damage (complete leaf desiccation, minimal trunk damage) there appears to be minimal impact on budburst but a reduction fruitfulness in the following season. Some vines may be more damaged than expected and collapse later. Consider pruning back to a cordon with short spurs or leave unpruned.

• High intensity fire damage (complete leaf desiccation, trunk damage) is usually sustained where the fire front hits the vineyard, or from the burning of dense grass within the vineyard and/or mulch applied along the vine row. If a substantial amount of the trunk is damaged, the vines are unlikely to survive – no remedial treatment can be justified. If the trunk is partially damaged then consider pruning back to a cordon with short spurs or leave un-pruned and re-assess after budburst in the following season.

• Re-growth after fire damage is unlikely to be fruitful due to insufficient time for bunch initiation to occur in the period after those shoots burst, under declining light intensity and temperatures.

• The results from this pilot study should be tested with greater replication of treatments or by controlled burning of vines to get around the spatial variability associated with uncontrolled ground fires.